

MULTIMODE

BAND CONVERTER

TECHNICAL MANUAL

General Installation Instructions

1. Introduction:

This unit is the universal means of converting all the commonly available SSB radios, using the MB 8719, MC 145106 and PLL 02A Phase locked loops to a six band, LoLo to HiHi and Legals plus A channel specification.

Coverage of these bands, or 10 metre (29.310 - 29.700) with optional repeater shift is also included for Cybernet AM/FM radios using the PLL 02A in the less familiar seven switch line configuration. Common examples of this are the Hygain III and Lafayette HB 940.

The unit can also be used to give full 10 metre (28.000 - 29.700) plus 10 metre FM (29.310 - 29.700) with optional repeater shift on the SSB radios above. This coverage is continuous 10KHz steps with no gaps or skips.

Whilst it is possible, on certain radios, to obtain full CB and 10 metre coverage, this would require expansion of the programming matrix on the unit and considerably more radio expansion than is detailed here. Only attempt this if you have experience of this operation.

In exceptional cases conversion will require one or more of the following:

- (a) Crystal and module band switching
- (b) Crystal change
- (c) PLL change

These changes, where necessary, are detailed in the specific chassis information.

Alignment of SSB radios after conversion will require a good quality frequency counter with a resolution of 10Hz. Basic alignment details are included.

It is intended that this unit be fitted by a reasonably competent technician who is familiar with CB radios. If this is not you, a complete fitting service is available through your dealer.

ENSURE THAT THE RADIO IS WORKING CORRECTLY BEFORE INSTALLATION

READ THROUGH ALL INSTRUCTIONS BEFORE STARTING TO CONVERT

Each unit is tested before despatch. If once installed it does not operate correctly you may assume that the fault lies in the installation. If all else fails the radio and unit can be returned to us through your dealer for correction. Under no circumstances will units on their own be accepted for checking or credit. Where a radio and unit are returned to us, the charge will be as for a normal fitted conversion, minus the cost of the unit and plus any repair charges on the radio.

No responsibility can be accepted by the dealer or ourselves for damage to the radio or unit during installation.

2. Module Preparation:

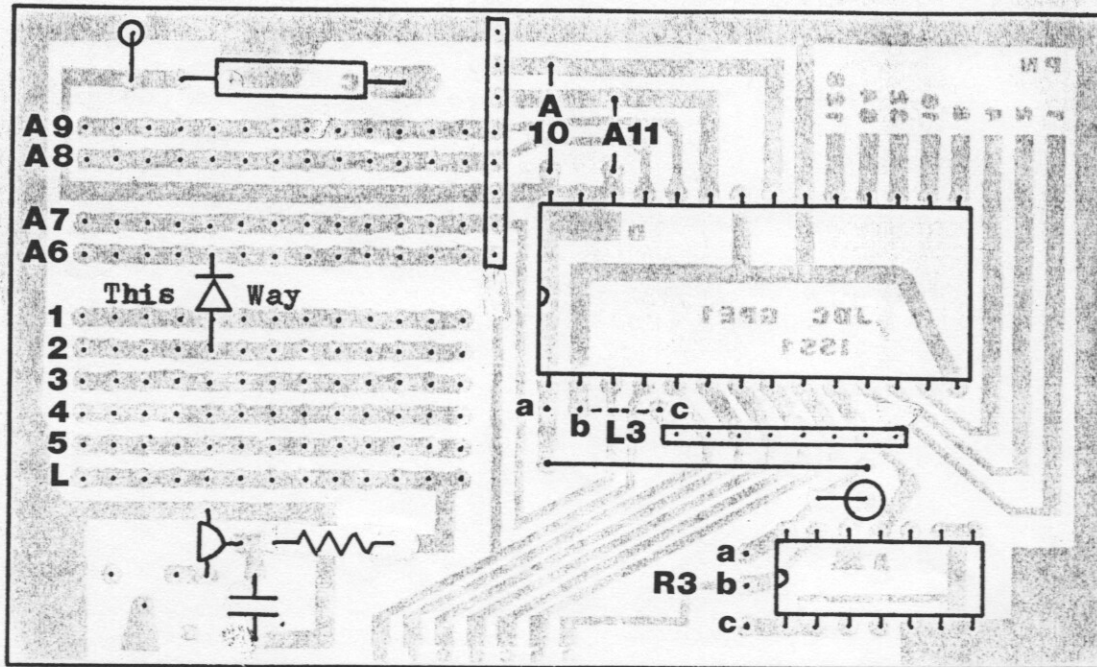
Refer to the Module Component/Track layout drawing and the appropriate Band data sheet. (CB or 10 metre). Identify the appropriate section of the data sheet for your radio. Next, read the relevant specific chassis section for the radio being converted to check for special instructions. (Only if Technical Manual is being used)

Now, using the band data sheet and module drawings, carry out the following:

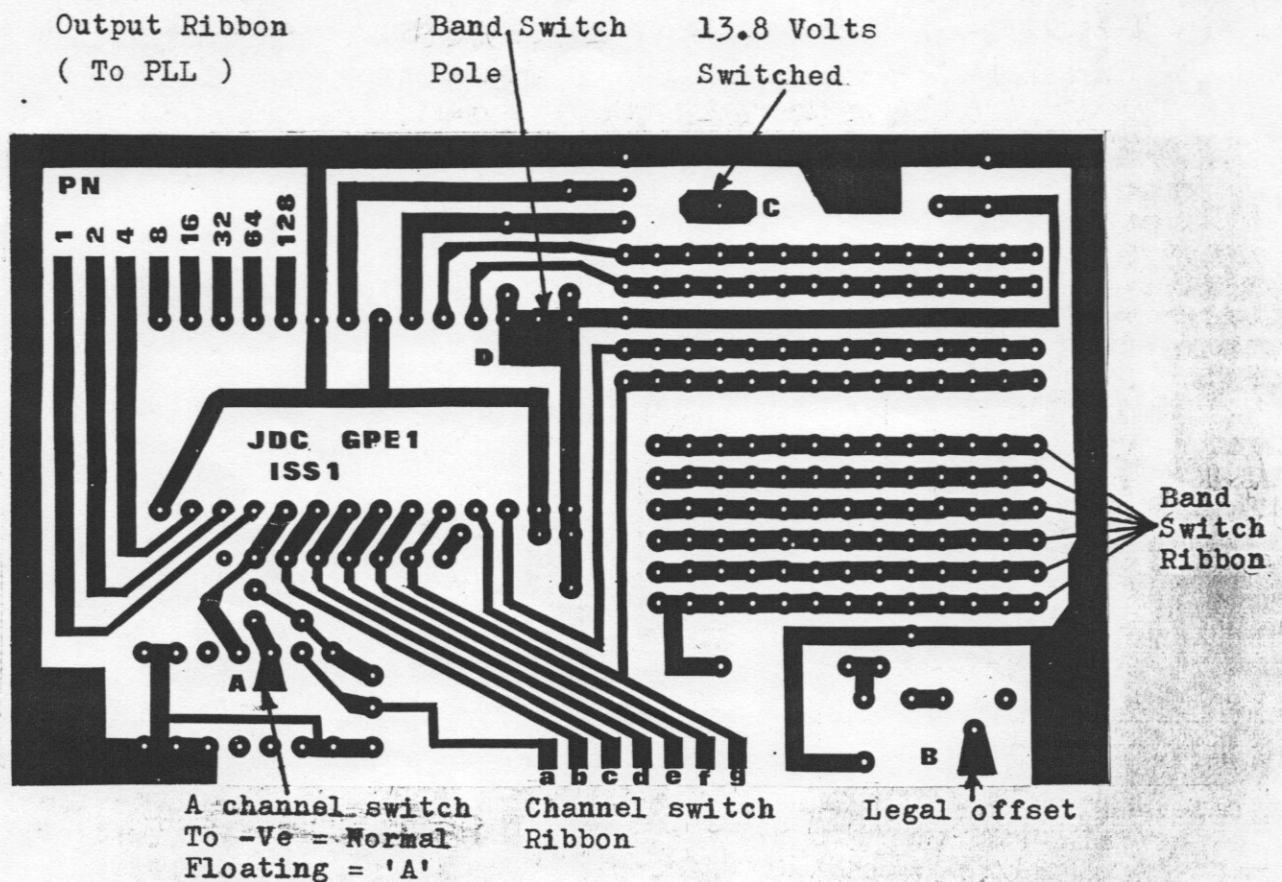
- 2.1. If All or A10 are shown as '1' for the bands you require, insert the appropriate links in the module as indicated. A 0 value means "link not required".
- 2.2 Programming lines A6 - A9 and band lines 1 - 5 and L (legal) are indicated on the drawing. It is intended that band 1 correspond to LoLo or 10m1, band 2 to Lo or 10m2 and so on. If only one or two bands are to be used, any band lines may be used. If legal is being added however the legal line should be used as crystal offset switching is only available on this band. On 10 metre conversions it is normal to exclude the 10m5 band as it would be a duplication if the 10FM band is being added.

Wherever a '1' appears on the data sheet for a particular band a diode should be fitted from this band line to the appropriate address line. Ensure diodes are fitted the correct way round. A correctly installed diode is shown, corresponding to a '1' on A6 on band 2. Where any of A6, A7, A8 or A9 are at '1' for ALL bands to be used this line can simply be tied to 5 Volts. The band switch pole connection is a suitable point for this.
- 2.3. Fit a link wire, L3, between the two points given on the data sheet.
- 2.4. Fit the 10K resistor supplied into the R3 position between the two points indicated on the data sheet. If A channels are not required link point A to -Ve. (Large track at edge of PCB). If A channels are to be used, insert a switch in this link.
- 2.5. If legal is being fitted and your radio has a 5KHz Tx shift, fit a 10K miniature vertical preset (not supplied) into the three holes next to the transistor. Fit a wire to point B which will go to the wiper of the shift control. The preset will then give legal frequency adjustment. If there is no 5KHz shift insert a wire into the hole nearest the transistor. This is used to switch a crystal trimmer.
- 2.6. Connect a six wire ribbon, (seven on O2A 7 bit radios), to points a - f, (a - g), Brown to point a, Blue to point f, (Violet to g). The other end of this is connected to the channel switch.
- 2.7. Connect an 8 wire ribbon to the output pads, Brown to '1', Grey to 128. The other end is connected to the PLL address pins.
- 2.8. Attach an appropriate ribbon to the band switch points on the module. The pole of the band switch is connected to point D as indicated.
- 2.10. Attach a Red wire to point C. This is taken to the switched side of the ON/OFF switch on the radio.
- 2.10. The module is mounted and earthed via copper wires (supplied), soldering to the cans of suitable transformers in the radio and the large earth track at the edge of the PCB.
This completes module preparation.

Module: Component side layout



Module: Track side connections



CB Band data sheet

RADIO	PLL	REF XTAL	BAND	A11	A10	A9	A8	A7	A6	L3	R3	COMMENTS
COBRA 148GTL DX	145106	15.000	LoLo	0	0	0	0	0	0	ac	ab	
			Lo	0	0	0	0	0	1			
			Mid	0	0	0	0	1	0			
			High	0	0	0	0	1	1			
			HiHi	0	0	0	1	0	0	-----		256 Bit Mod above 28.245
			Legal	0	0	0	1	0	1			
CYBERNET 059 059 M360 Type 121 125 JUMBO MAJOR CONCORDE HYGAIN SEE NOTES ETC	PLL02A	20.105	LoLo	0	0	0	1	1	0	bc	bc	256 Bit Mod on LoLo and Lo Band
			Lo	0	0	0	1	1	1			
			Mid	0	0	1	0	0	0			121 PCB Use Xtal and EPROM
			High	0	0	1	0	0	1			
			HiHi	0	0	1	0	1	0			
			Legal	0	0	1	0	1	1			
COBRA 148GTL DX MKI PRESIDENT VARIOUS STALKER IX	MB8719 or	11.325 15.480	Mid	0	0	1	1	0	0	ac	ab	7 Output lines from unit only '128' not used.
			High	0	0	1	1	0	1			
			Legal	0	0	1	1	1	0			
COBRA 148GTL DX MKI WITH MKII PLL SEE NOTES	MB8719 146106	15.030	LoLo	0	1	0	0	0	0	ac	ab	Both PLL's are used. Ref Xtal is original Lo Xtal.
			Lo	0	1	0	0	0	1			
			Mid	0	1	0	0	1	0			
			High	0	1	0	0	1	1			
			HiHi	0	1	0	1	0	0	-----		256 Bit Mod above 28.275
			Legal	0	1	0	1	0	1			
HYGAIN III LAFAYETTE HB 940 and OTHERS	II PLL02A 7 BIT SEE NOTES	20.480	LoLo	0	1	0	1	1	SW	bc	bc	
			Lo	0	1	1	0	0	SW			
			Mid	0	1	1	0	1	SW	-----		A6 is used as switch line
		20.705	High	0	1	1	0	1	SW			
			HiHi	Crystal to be used								
		20.705*	Legal	0	1	1	1	1	SW			

10 Metre Band Data Sheet

[illegible]

3. Specific Chassis Information:

- 3.1. Cobra 148GTL DX MKII, Superstar 360FM MKII and MKIII.
Uses PB 010 AA or AB PCB and single 15.000MHz crystal. PLL is MC145106P.

3.1.a. Recommended Conversions:

Full LoLo - HiHi + legals is no problem here using only the module. 10 metres is also straightforward and the radio will, without too much trouble, do both although the Rx mixer stage would require broadbanding for this. Once installed this unit bypasses the binary adders in the radio.

3.1.b. VCO expansion and setting:

Add 220pf across C96, (VCO coil L18 to D31/D32 varicap coupling cap).
Add 220pf across Pins 7 and 8 of PLL. (PD and LD pins).
Cut Yellow wire from band switch and connect to -Ve.
Adjust VCO coil L18 to just lock on the lowest frequency to be used.

3.1.c. Band Switching:

Apart from the Yellow all other wires on the band switch are not required and can be cut back. A single pole rotary switch having the correct number of positions should be fitted in place of the original.

3.1.d. PLL Address Pins:

These are Pins 17 - 9. Pin 9 is the 256 bit and is normally connected to earth by a link. If frequencies above 28.245 are to be used this link should be removed. See special mods below for connection of this pin. The tracks to the pins 10 - 17 should be cut and the output ribbon from the module connected, Brown to pin 17, Grey to pin 10.

3.1.e. Channel Switch connections:

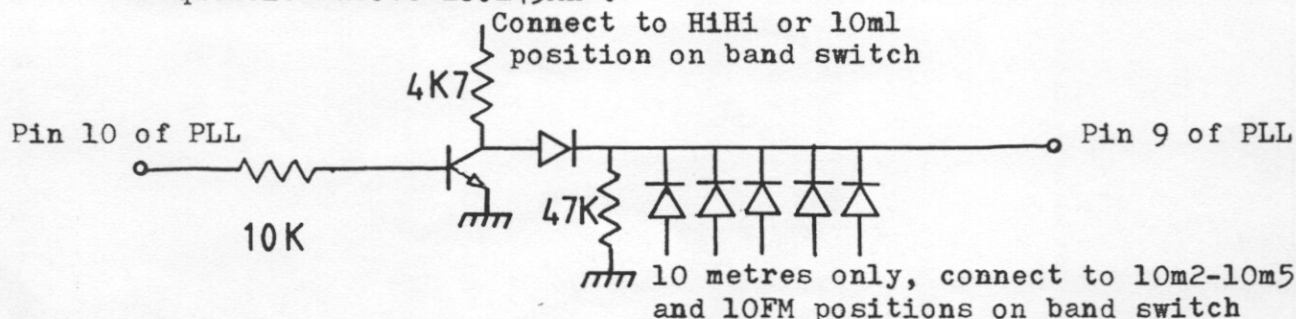
A 9 wire ribbon connects the channel switch PCB to the Main PCB. Locate the Main PCB end of this. Starting from the ribbon wire closest to the chassis the switch ribbon from the module should be connected in the order, Blue, Orange, Green, Red, Yellow, Brown.

3.1.f. Legal Offset:

No problem here, with a 10K preset in the module connect the wire from point B to the centre of the 5KHz shift control. (Yellow wire marked Cose M on main PCB).

3.1.g. Special Mods:

Pin 9 of the PLL is connected as follows. This is only required for frequencies above 28.245MHz.



3.1. Contd.

3.1.h. Frequency Setting:

Connect a frequency counter to TP3 (next to L 11). Set Fine and Coarse tune controls to centre and select channel 20 Mid band or 10m3. In Rx mode adjust:-

		Mid band	10m3
FM	adjust L 32 for	16.51000	18.29500
USB	" L 33 "	16.51250	18.29750
LSB	" L 34 "	16.50750	18.29250

Key mic on LSB and adjust VR6 for same frequency as on Rx.

Connect frequency counter to TP6 (to right of IC3).

CW Tx	Adjust L37 for	10.69500
USBRx	" L38 for	10.69250
LSBRx	" L39 for	10.69750

If legals are fitted select FM legals channel 20 and adjust preset on module for Tx frequency of 27.79125MHz.

The frequencies are now set. Realign Tx and Rx strips on a frequency corresponding to the centre of the new coverage of the radio.

3.2. Cybernet PLL 02A radios using the 059 split board PCB. e.g. Jumbo MKI, Multimode II, Concorde (most), Major M588(2 crystals only), Major M360 (slightly different on crystal switching).

3.2.a. Recommended Conversions:

LoLo - HiHi + Legals is OK but you will have to struggle a bit for power on HiHi's or band switch the Tx mixer. (Details given). VCO range is also tight though it can be stretched. LoLo - Hi + Legal is quite a bit easier so only add HiHi if you really want it. It is true that using a combination of crystal switching and Eprom eliminates some of these problems but the requirement for two switch poles to switch the crystals plus the advantage of much improved LSB frequency accuracy by using one crystal only makes the Eprom only option a better bet.

10 metre conversion is OK but with the same power constraints. Some broadbanding is described but you should be prepared to play!

CB conversions are based on the 10.0525 crystal, (20.105 in M360). 10 metre conversions are based on the 10.165 crystal, (20.330 in M360) The 10MHz crystals work straight into a doubler and what follows is the same for other 02A chassis.

3.2.b. VCO expansion and setting:

The VCO is band switched by applying different DC voltages to the 'a' point next to the green VCO block. The source of these voltages is (1), Fixed 5V from pll supply, (2), Variable 0-8V from two presets on the PCB. These are selected by the original band switch. It will be necessary to band switch the VCO on the converted radio so a switch with two poles will be required.

3.2. Contd.

3.2.b. contd.

For LoLo to HiHi + legal an additional preset of about 10K should be wired across the supply and earth end of one of the original presets. Its wiper connection will then give an additional variable voltage source for the VCO.

One pole of the new band switch will be connected to the 'a' point on the main PCB. The LoLo and Lo positions of this side of the band switch should be linked together and connected to the wiper of one of the presets, the mid and Hi positions should also be linked and the fixed 5v supply wire (from point A next to PLL) connected to this link. The remaining two presets are connected to the legal and HiHi positions of the band switch respectively.

The VCO core is adjusted on channel 40 of hi band to just produce lock. The appropriate presets are then adjusted to give lock on channel 1 to 40 on all the other bands. Beware when doing this that what may appear to be an out of lock condition may actually be the transmit power dropping down preventing the frequency counter from reading. If so temporarily adjust the transmit mixer coils, T2-T5 to raise the power.

The same procedure should be adopted on 10 metre conversions linking 10m1 and 10m2, 10m3 and 10m4 and finally 10FM. No additional preset should be required but can be used if problems arise.

3.2.c. Band switching:

The simplest procedure for disabling the band switch is to cut off all wires from the switch and to remove it. Some radios use flick switches instead of rotary switches but the principle is the same. Now identify the wires as follows.

- 2 screened cable braids.....Leave connected together and insulate
- 3 crystal wires and one crystal common. (Point 4 on front PCB)
- Do not shorten these wires, connect the wire from the crystal to be used to the common wire and insulate the joint. Insulate the ends of the other crystal wires.
- 3 crystal trimmer wires. Connect any one to -Ve, this will be the trimmer used. Insulate the remaining two wires but do not cut.
- 2 Channel switch wires. Remove the front one on the channel switch PCB and earth the rear one. This removes the 41-80 channel display function.
- 4 VCO wires (previously identified)
- Hi light wire. (If fitted). Discard this.

The M360 uses diode switching for the crystals. There are no trimmer wires and the band switch common is an 8v supply, usually Pink.

One side of the new band switch has already been described. The other side is used to band switch the module as previously explained. The new band switch can be fitted on M588 and M360 to the right of the S meter with care.

3.2.d. PLL Address Pins:

These are pins 15 - 7. Pin 7 is the 256 bit and is normally tied to earth. Two track cuts are required to isolate it. This is only necessary if frequencies below 26.965 are to be used on the module.

3.2.d. contd.

See special mods below for connection of this pin. The tracks to pins 15 -8 should be cut and the output ribbon from the module connected, Brown to pin 15, Grey to pin 8. Note that pins 9 and 10 were originally tied to 5v and that when isolating the pins the continuity of the track should not be broken.

3.2.e. Channel Switch connections:

The channel switch ribbon from the module is connected to the non-PLL side of the track cuts in 3.2.d. above at suitable points on the track. Connection is only made to six tracks as follows.
Brown to pin 15 track.....Blue to pin 10 track.

3.2.f. Legal Offset:

If your radio has a 5KHz shift and legals have been fitted, connect the wire from point B on the module to the wiper of the shift control. Some radios, notably Multimode II, have a switch to disable the shift. If this is the case the legal offset will only operate when this switch is on. Better frequency accuracy is obtained when on so on balance it is better to disable the switch to the on position permanently.

If there is no 5KHz shift, a 60pf trimmer should be connected to the common point of the three (or two on M588), crystal trimmers. The other end is taken to the transistor on the module as described before.

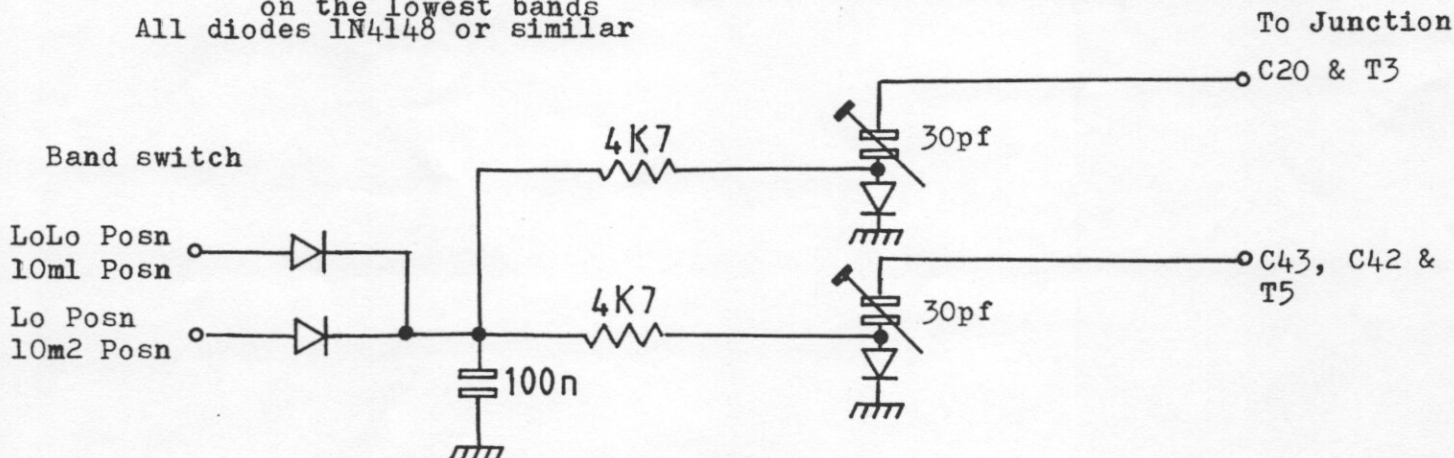
3.2.g. Special mods:

Pin 7 of the PLL is connected as follows:
(Only required for LoLo and Lo bands)



On 10 metre conversions it will be necessary to add 22pf across C14 (behind T1). This may also be of help in HiHi conversions where difficulty is experienced on power output.
If necessary the following Tx mixer mod can be used to flatten out power.

The coils T2-T5 are adjusted on the higher bands and trimmers on the lowest bands
All diodes 1N4148 or similar



3.2. Contd.

3.2.h. Frequency Setting:

Connect a frequency counter to TP4 (RHS of VCO block). Set clarifier control/s to centre and select channel 20 Mid band or 10m3. In Rx mode adjust:-

	CB Bands	10 Metre Bands
USB	adjust crystal trimmer for 20.10500	20.33250
LSB	" CT5 " " 20.10350	20.33100
	Front small PCB	

Connect frequency counter to TP5 (front left hand corner of main 059 PCB).

USB adjust CT5 for 10.69500
LSB adjust CT4 for 10.69200

If legals are fitted select FM legals channel 20 and adjust preset on module or added offset trimmer on radio for 27.79125 on Tx.

The frequencies are now set, realign Rx and Tx strips on a frequency corresponding to the centre of the new coverage.

3.3. Cybernet PLL 02A radios using the 121 or 125 single board and 20 MHz mixing crystals. e.g. Hygain V, Jumbo II, Lafayette 1200, Tristar 747& 777, Colt Excalibur etc.

3.3.a. Recommended Conversions:

The circuitry in these radios is almost the same as for the 059 chassis although the PCB layout is quite different.

The significant circuit differences are:

VCO is not band switched so range is a problem.

Crystals are diode switched from a common 8v line. This makes switching easier.

The 125 PCB already has band switched adjustment of the Tx mixers so power is not usually a problem.

All the normal conversions are possible but the approach is to use a combination of crystal switching and Eprom codes. e.g.

LoLo Band	Use Lo band codes on Eprom and Low band crystal. (19.880)									
Lo Band	"	Mid	"	"	"	"	"	"	"	"
Mid Band	"	"	"	"	"	"	Mid	"	"	(20.105)
Hi Band	"	"	"	"	"	"	Hi	"	"	(20.330)
HiHi Band	"	Hi	"	"	"	"	"	"	"	"
Leg Band	"	Leg	"	"	"	"	Mid	"	"	(20.105)

10m1 Band	Use 10m3 band codes on Eprom and Low Band crystal (19.880)									
10m2 band	"	10m3	"	"	"	"	Mid	"	"	(20.105)
10m3 band	"	"	"	"	"	"	Hi	"	"	(20.330)
10m4 band	"	10m4	"	"	"	"	"	"	"	"
10m5 band	"	10m5	"	"	"	"	"	"	"	"
10FM band	"	10FM	"	"	"	"	"	"	"	"

One side of the new band switch is used to switch the crystals and the other side switches the Eprom.

3.3. Contd.

3.3.b. VCO expansion and setting:

No expansion is necessary. Adjust the VCO core for lock on the highest frequency to be used.

3.3.c. Band switching:

As for 059 PCB (see 3.2.c.). No VCO switching however as above.

3.3.d. PLL address pins:

As for 059 PCB. Note that the 125 PCB usually has wires to the PLL from a separate channel switch PCB.

3.3.e. Channel switch connections:

As for 059 PCB. On 125 PCB the wires from the channel switch PCB could be taken direct to the module.

3.3.f. Legal offset:

As for 059 PCB. Note that if there is no 5KHz shift the added trimmer should be connected to the junction of the appropriate crystal and its associated trimmer. On 121 PCB's the crystals are on a separate PCB.

3.3.g. Special mods:

125 PCB

Only the pin 8 PLL mod is relevant. This is as for 059PCB.

121 PCB. As for 059 PCB.

3.3.h. Frequency setting:

As for 059 PCB. On 121 PCB TP4 is in the same place, usually. On 125 PCB TP4 is in front of, and to the left of the VCO block. TP5 is to the left of, and to the rear of, the 10.692 crystal usually under the relay PCB.

3.4. Cobra 148GTL DX MK I (3 crystal type PC 879AB) See also next section. President SSB radios, (using MB8719 PLL and 11.3258 Mid crystal), Stalker IX etc.

3.4.a. Recommended conversions:

The MB 8719 PLL is very restricted in its coverage since the 7th address line, (normally '64') is actually '64' or '128'. Also there is no '256' pin. Therefore the module is only able to give suitable codes for Mid, Hi and Legals. Actually though this is not as restrictive as it might seem. Using a combination of crystals and Eprom it is possible to obtain LoLo-Hi + legals on most radios and HiHi's on some. In most cases however it is easier to change the PLL (or rather add one since both are used), to a MC145106 and to use the next section. Details of the PLL change are given for the MK I Cobra 148GTL DX but the principle is the same on other radios although reference crystals may need altering. Two examples are given here of the method.

3.4. Contd.

3.4.a. contd.

Cobra 148GTL DX MK I

Change original Lo band crystal to 14.580 from 15.030. Then:

LoLo Band	Use Mid band codes and 14.580 crystal
Lo Band	" Hi " " " "
Mid Band	" Mid " " " 15.480 "
Hi Band	" Mid " " " 15.930 "
HiHi Band	" Hi band " " " "
Leg Band	" leg " " " 15.480 "

President Madison - Normally Mid and Hi bands are standard

Change Hi band crystal from 11.4758 to 11.0258. Then:

LoLo Band	Use Mid band codes and 11.0258 crystal
Lo Band	Use Hi " " " " "
Mid Band	" Mid " " " 11.3258 "
Hi Band	" Hi " " " " "
Leg Band	" Leg " " " " "
HiHi Band	Would require another switched crystal, not easy on this.

New crystals will require some padding out to match the existing ones.

3.4.b. VCO expansion and setting.

Cobra chassis: Add 220pf across C74. (VCO coil to varicap coupling).

President chassis: Using uHIC007 VCO pack, Cut R95. (in front of VCO pack)

VCO coil is adjusted for lock on highest frequency to be used.

3.4.c. Band switching:

The myriad of chassis involved here makes specific instructions impossible. In most cases however a 2 pole band switch will be required, one side switching the module and the other switching crystals.

3.4.d. PLL address Pins:

These are pins 16-10, since there are only 7 address pins the '128' output on the module is left unconnected. The tracks to these pins should be cut and the output ribbon from the module connected, Brown to pin 16, Violet to pin 10. Often there is no track to pin 10.

3.4.e. Channel switch connections:

The channel switch ribbon from the module is connected to the NON PLL side of the track cuts. Brown to pin 16 track, Blue to pin 11 track.

3.4. Contd.

3.4.f. Legal offset:

On radios with a 5KHz shift the 'B' wire from the module is connected to the centre of the shift control. If there is no shift control a 60pf trimmer should be connected to the appropriate crystal. This is then switched by the transistor wire on the module.

3.4.g. Special mods:

No special mods are usually needed on these chassis. When ordering crystals specification DR8 should be quoted.

3.4.h. Frequency setting:

Cobra 148GTL DX MK I: As for MK II, see section 3.1.g.

President Radios: Some variations exist but usually as follows. Connect a frequency counter to TP21, (L21 secondary). Set clarifier controls to centre and select Mid band channel 19 USB. Adjust:

USB CT1 to 33.9765
AM L23 to 33.975
LSB L22 to 33.9735

Connect frequency counter to TP3, (to right of L14, end of screened cable) Disconnect TP7 & TP8, (RHS of PCB, half way back), and adjust:

USB CT2 for 7.8015
LSB L30 for 7.7985
AM L31 for 8.8000 on TX

The frequencies are now set, realign Tx and Rx on a frequency near to the centre of the new coverage.

3.5. Cobra 148GTL DX MK I using MB8719 PLL and 3 crystals. This section describes conversion of the MK I to the MK II PLL using the original Xtal thus allowing full CB and 10 metre conversion as described in 3.1.

A MC145106P PLL will be needed for this and is obtainable from your dealer. The original Lo crystal is 15.030, the MK II uses a 15.000 crystal, the Eprom information is thus adjusted on these bands to correct for this. To add the new PLL proceed as follows:

1. Cut tracks to pins 17-10 of the MB8719.
2. Isolate pins 5-8 of the MB8719
3. Add 10k resistors to -Ve from pins 10-16 of MB8719. (On component side)
4. Attach new PLL on track side of PCB immediately under the MB8719 aligning pin 18 of both PLL's and with IC legs uppermost.
5. Connect pin 18 of new PLL to pin 18 of MB8719
6. " " 1 " " " " " 9 " "
7. " " 3 " " " " " 8 track (now isolated from MB8719)
8. " " 4 " " " " " 7 " " " " "
9. " " 7 " " " " " 5 " " " " "
10. " " 2 " " " " " 17 " " " " "

Important There are two tracks from pin 8 of the MB8719. When isolating pin 8 these tracks must be linked back together or FM RX sensitivity will be lost. Disable band switch to Lo position and proceed as in 3.1.

3.6. PLL 02A Type radios using 7 switch lines from the channel switch instead of 6. These radios are normally AM/FM only. e.g. Hygain III, Lafayette HB 940 etc.

3.6.a. Recommended conversions:

LoLo - Hi + Legals is quite straightforward on this using the normal crystal reference, (which is 10.24 doubled to 20.480), for LoLo, Lo and Mid bands and the Hi crystal for legals and Hi band. Thus for Hi band the Mid band codes are used.

Two 10 metre bands are included, 29.310 - 29.700 and 29.210 - 29.600 which, with suitable switching can be arranged to give repeater shift operation. These operate on the original Hi crystal. (20.705).

3.6.b. VCO expansion and setting:

No expansion is normally required but if range is short a 220pf cap across C4 (VCO coil to varicap coupling) should do the trick. Adjust VCO coil (L1) to lock on the highest frequency to be used.

3.6.c. Band switching:

A rotary 2 pole switch should be used to replace the original band switching. This radio normally has 1-40 and 41-80 display. Two wires from the CH switch PCB are selectively switched to earth to achieve this. Earth the one which gives 1-40 and discard the other. One side of the band switch is used to switch the crystal and the other to band switch the module.

3.6.d. Pll address Pins:

These are pins 15-7 of the PLL 02a. For all CB bands the 256 bit, pin 7 is not touched. (It is tied Hi). For 10FM use pin 7 is isolated and connected to earth. The output ribbon from the module is connected to pins 15-8, having isolated them by cutting tracks, Brown to pin 15 Grey to pin 8.

3.6.e. Channel switch connections:

The channel switch ribbon from the module is connected to the NON PLL side of the track cuts above, Brown to pin 15 track, violet to pin 9 track.

3.6.f. Special mods:

If CB and 10FM are being fitted, pin 7 of the PLL should be earthed via a 47K resistor and fed via a diode from the 10FM band switch position.

3.6.g. Frequency setting:

These are set on Tx using CTL on the main PCB to adjust the 20.480 crystal and CTL on the crystal PCB to adjust the 20.705 crystal. The legal offset wire from the transistor on the module is taken to the junction of the Hi crystal and its trimmer via a 60pf trimmer. This trimmer will then adjust legal frequencies. Finally realign Tx and Rx on a frequency corresponding to the centre of the new coverage.